HII Regions in IC 1613: The ISM in a Nearby Dwarf Irregular Galaxy

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IC 1613, a nearby (725 kpc distant) dwarf irregular galaxy, has always been known to contain large, ring-shaped HII regions in its northeast corner. A new Hα image has been obtained using the Bell Labs CCD camera (on loan from J.A. Tyson), an RCA 320 X 512 pixel-thinned, back-illuminated CCD, an Hα filter of central wavelength 6562 Å and width (FWHM) of 30 Å, and the 42 inch telescope at Lowell Observatory. Our low resolution (2"6 pixels, 3"4 PSF) images exhibit many new, faint features. Figure 1 shows the entire CCD Hα image (11'.1 in R.A. by about 6'.1 in declination), on which HII regions are labelled: S1, S2, S3, etc. for HII regions catalogued by Sandage (1971, Ap. J., **166**, 13); HI, HII, HIII, etc. for HII regions which are new to this study; and D1, D2, and D3 are some representative "diffuse" areas of emission, areas where the HII region boundaries are not clearly delineated, but there is emission nonetheless. In Figure 2, we compare our image (at high and low contrast) with Sandage's (1971) photo of the northeast corner of IC 1613. Hodge et al. (this volume) present higher resolution images of the same area. Figure 3 compares the Hα luminosity function for HII regions in IC 1613 (open squares) with that for the Small (filled squares) and Large (crosses) Magellanic Clouds. The last two figures compare observed size distributions- number of HII regions larger than a given diameter vs diameter- for IC 1613 (Figure 4) and NGC 6822 (Figure 5) with two models:

(1) Poisson distribution: $N^*(D) = \sum_n \frac{(D_o)^n \exp(-D_o)}{n!}$

(2) exponential distribution: $N^*(D) = N_o - N_o \exp(D/D_o)$,

where n= 0,1,2, etc., and stands for the "bin number", (n = 0 for D = 0-5 pc, n = 1 for D = 5-10 pc, etc.), D_o is the average HII region diameter, and N_o is the total number of HII regions in the sample. We see that the Poisson models provide a better fit for IC 1613 and NGC 6822.

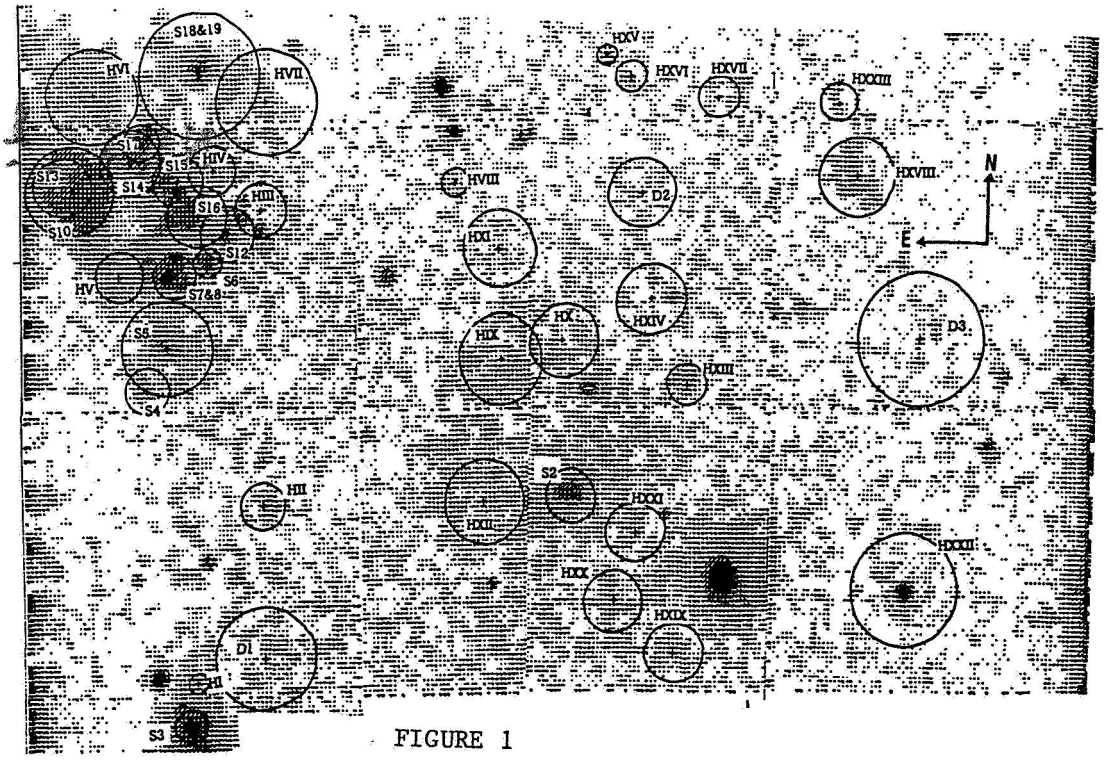
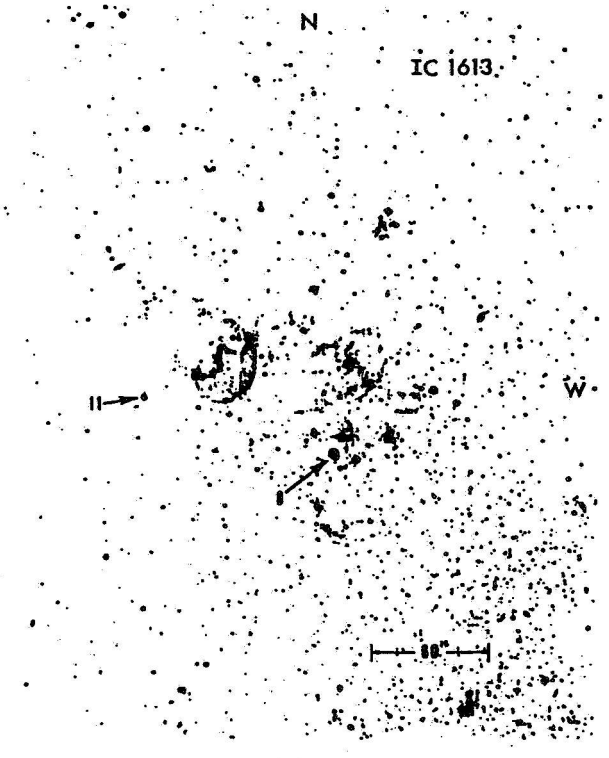
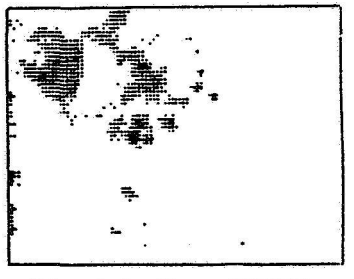


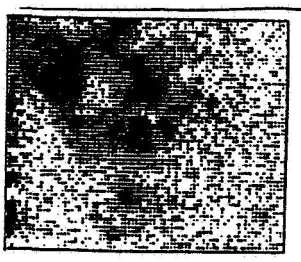
FIGURE 1



Sandage (1971)



This study (low contrast)



This study (high contrast)

All to the Same Scale

Figure 2

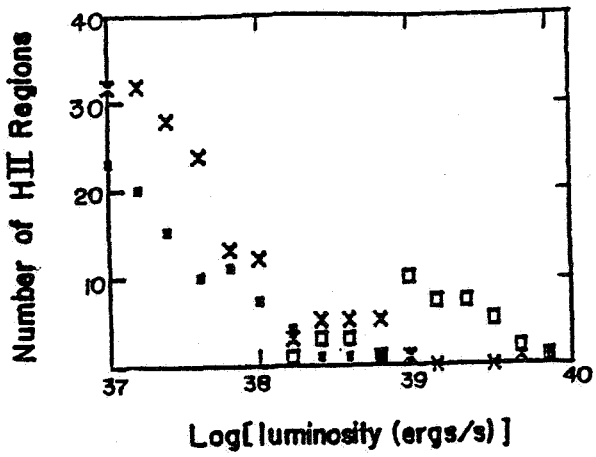


Figure 3. The Hα luminosity function for: IC 1613 (open squares), the SMC (filled squares) and the LMC (crosses). The plot is the number of HII regions vs. log(Hα luminosity), binned every 0.2 dex. Data for the Magellanic Clouds from Kennicutt, Edgar, and Hodge's recent work (1989, Ap. J., 337, 761).

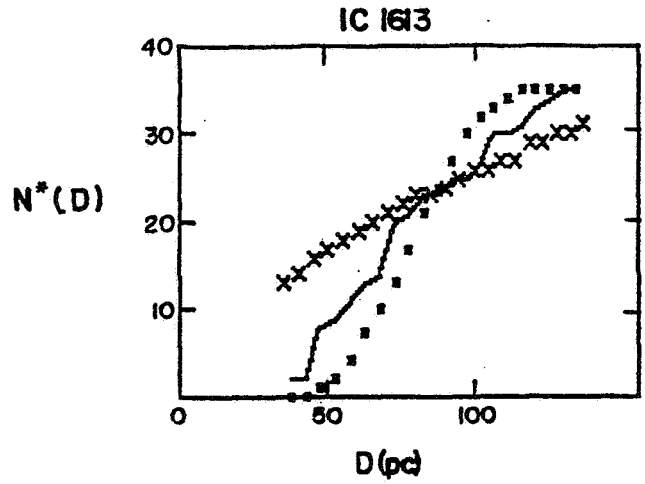


Figure 4. Size distribution for HII regions in IC 1613. The number of HII regions larger than diameter D is plotted vs. D for: data (solid line), Poisson distribution (filled squares), for an average diameter 83 parsecs, and exponential model with N_o = 35, D_o = 83 pc (crosses).

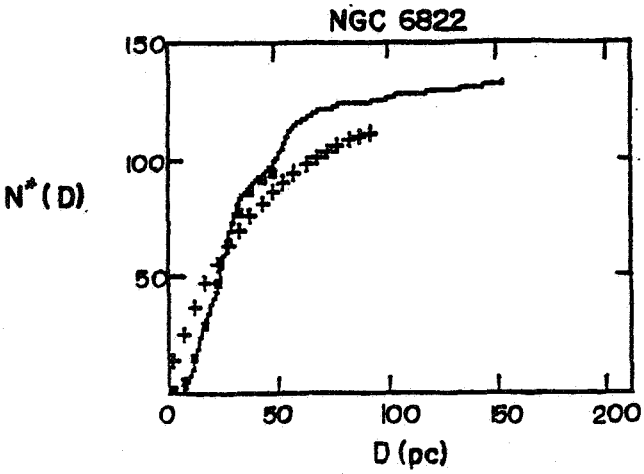


Figure 5. Size distribution for HII regions in NGC 6822 (data from the recent work by Hodge, Lee, and Kennicutt: 1988, P.A.S.P., 101, 32). The same symbols are used as in Fig. 4. For the Poisson distribution only the first ten bins were used, so the average HII region diameter is 24 pc. In the exponential model for the whole sample, N_o = 134, and D_o = 43 pc.